IEc

DRAFT PROSPECTIVE OUTLOOK FOR EPA

National Advisory Council for Environmental Policy and Technology (NACEPT)

24 October 2008

INDUSTRIAL ECONOMICS, INCORPORATED

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U.S. Environmental Protection Agency
Office of Cooperative Environmental Management
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[TO BE COMPLETED]

INTRODUCTION

In 1988, pursuant to the Federal Advisory Committee Act (FACA), P.L. 92-463, EPA established the National Advisory Council for Environmental Policy and Technology ("NACEPT" or "Council") to provide independent advice to the EPA Administrator on a broad range of environmental policy, technology and management issues. The Council's primary customers are the EPA Administrator, the program offices, and the regions. Administratively, NACEPT resides within EPA's Office of Cooperative Environmental Management (OCEM).

To mark NACEPT's 20th anniversary and its achievements over the last two decades, and to help ensure that this record of success continues, OCEM led an effort to:

(1) Identify the issues and challenges that EPA will face and should focus on over the next 10 years;

(2) Review NACEPT's operations and accomplishments since 1988; and

(3) Develop a strategic framework for how NACEPT can best serve EPA based on the prospective and retrospective findings.

EPA asked NACEPT to address the first component of identifying the issues and challenges that EPA will face over the next 10 years, and the approaches the Agency might take to address those issues. This report represents NACEPT's findings and recommendations to EPA.

NACEPT has previously addressed the challenge and value of looking ahead to spotlight future trends and issues. In its 2002 report, The Environmental Future: Emerging Challenges and Opportunities for EPA, NACEPT noted that "[o]ur nation's approach to environmental protection has been largely reactive…..Futures analysis, the art and science of anticipating nascent environmental issues, encourages proactive thinking to prevent potential problems, rather than responding after the fact."

STUDY APPROACH

This prospective analysis builds upon the work completed by NACEPT as well as several other groups and organizations who similarly looked ahead to identify important environmental trends and issues. OCEM enlisted contractor support from Industrial Economics, Inc. (IEc) in preparing this report, which comprises two main components: a review of previously completed "futures" analyses and structured interviews with fifteen leaders from industry, academia, state and tribal government, and non-governmental organizations.

INITIAL RESEARCH OF FUTURES LITERATURE

As noted, NACEPT and many other groups and organizations have attempted to look ahead and identify the emerging trends and issues that will impact the environment. IEc reviewed a number of reports and studies that described how these different groups identified the trends that will most likely impact the environment over the next ten years; the issues that would emerge from those trends and would be most important for EPA to address; and how the Agency might do so.

PROSPECTIVE STUDY INTERVIEWEES

As a first step, OCEM and IEc developed a comprehensive list of interview questions with the intent to provoke thoughtful observations on future environmental issues and trends of importance, as well as EPA's role in addressing those issues and trends.

EPA selected seventeen individuals from a variety of government, corporate, and academic positions who are all recognized, influential leaders in their respective fields.

Of the seventeen individuals selected, fifteen agreed to participate. The individuals who volunteered to share their perspectives and suggestions as part of this study are identified in the text box.

In addition to the positions they hold currently, several of the prospective interviewees gained in-depth knowledge of EPA's relationship to environmental issues and trends by playing significant roles in the environmental regulatory community. Some served in public positions, including a former member of the U.S. House of Representatives, a former EPA Deputy Administrator, and a former EPA Chief Information Officer. As a result, the interviews reflect a strong awareness of EPA's past and present policies, procedures, and programs.

The prospective report presents the ideas, concerns, and suggestions offered by the interviewees, but to ensure an open dialogue in the interviews, the report does not attribute specific comments to any of the individuals.

INTERVIEW APPROACH

After initial contact by EPA, IEc scheduled and conducted all fifteen interviews by telephone during September 2008. EPA staff and NACEPT members were invited to join the calls, but did so almost exclusively as observers rather than participants. The interviews consisted of ten questions (see text box) that had been provided to the interviewees in advance. For consistency across interviews, IEc posed each question, in order, to each interviewee but quickly moved on when it was clear that the subject had been addressed in response to an earlier question.

PROSPECTIVE STUDY INTERVIEWEES

George Daston, Research Fellow – Proctor & Gamble Company

Otto Doering, Professor of Agricultural Economics – Purdue University

Jim Greenwood, President and CEO - Biotechnology Industry Organization

Hank Habicht, Managing Partner – SAIL Venture Partners

Nancy John, Director – Cherokee Nation, Environmental Protection Commission

James H. Johnson, Jr., Dean of College of Engineering, Architecture and Computer Sciences - Howard University

Jack Keenan, Chief Operating Officer – Pacific Gas & Electric

Drew Kodjak, Executive Director – International Council on Clean Transportation

Jonathan Lash, President - World Resources Institute

Bill McDonough, Founding Partner - William McDonough + Partners

Kim Nelson, Executive Director for eGovernment - Microsoft

Dianne Nielson, Energy Advisor - State of Utah

Lester Snow, Director – California Department of Water Resources

Robert Stavins, Director of Harvard Environmental Economics Program - Harvard University

Wilma Subra, President – Subra Company

The calls were not recorded, but IEc took detailed notes during each and prepared summaries that were sent to the interviewee for review, addition, and clarification as needed. The information from the notes was then compiled for analysis.

QUESTIONS FOR NACEPT PROSPECTIVE ANALYSIS

1. What do you consider to be the most influential long-term trends or forces (whether social, economic, technological, or otherwise) that are most likely to impact the environment over the next ten years?
2. What is your opinion on whether EPA is adequately addressing these trends or developments?
3. What steps could EPA take to improve its ability to anticipate and address these trends and related issues?
4. What do you consider to be the top environmental issues or challenges that the EPA must address in the next 10 years?
5. What might limit the Agency's ability to respond to the identified issues?
6. What are some specific steps that the Agency could take to respond to the issues and overcome the constraints?
7. What might the Agency look like ten years from now and what major changes in the way the Agency currently operates should be implemented now to achieve this ten year vision?
8. Over the next ten years, how would you define success for the EPA?
9. What measures would indicate success or failure for the Agency in the next ten years?
10. Is there anything else that you would like to add?

TRENDS AND THEMES IDENTIFIED IN SELECTED FUTURES STUDIES

The following summaries of selected reports are not intended to serve as comprehensive compilations of the points raised in those reports. Rather, they have been selected to illustrate the types of futures analyses that have been recently conducted and to highlight the key points raised that addressed the questions raised in the interviews conducted in this study; namely emerging trends and issues and how EPA might most appropriately address them in the future.

NACEPT 2002. "THE ENVIRONMENTAL FUTURE: EMERGING CHALLENGES AND OPPORTUNITIES FOR EPA."

NACEPT was asked to recommend a process to enhance EPA's ability to identify emerging trends and issues. As part of the process, NACEPT identified six broad themes as one way to organize the review of emerging trends, and identified immediate (I), mid-term (M-T), and long term (L-T) opportunities for EPA within each theme. The six themes and representative opportunities noted in the report for each, are listed below.

World Population and Demographics:

- Facilitate the export of environmentally superior technologies (I)
- Elevate EPA's international role (M-T)
- Establish an Envirocorps similar to Peace Corps (L-T)

Natural Resources:

Energy

- Expand Energy Star program (I)
- Promote market-oriented measures for reducing global warming (M-T)
- Support research on carbon sequestration (L-T)

Water

- Enhance efforts to include non-point sources in water management (M-T)
- Support an effective market environment to minimize hazardous waste generation (L-T)

Biodiversity

- Develop natural resource partnerships (M-T)

- Expand efforts to control invasive species (L-T)
- Develop a strategy to address health impacts of food additives (L-T)

Air

- Develop a multi-pollutant approach to air pollutants (M-T)
- Support research on ultra-clean coal technology (L-T)

Science and Technology

- Marshal sound science to develop and defend standards (M-T)
- Promote emerging developments in biotechnology and nanotechnology (L-T)

Information Management and Access

- Expand EPA's information and communication role (I)
- Improve information coordination (M-T)
- Perfect integrated monitoring technologies (L-T)

Economics and Commerce

- Continue to identify cost-effective environmental technologies (I)
- Improve permitting to foster environmental justice (M-T)
- Assist in preventing ecological-economic development failure (L-T)

Politics and Social Evolution

- Improve capacity to track state and tribal environmental performance (I)
- Create new opportunities for NGO and stakeholder input (I)
- Support a global reporting initiative (M-T)
- Sustain US global participation

In addition to identifying opportunities for EPA activity within specific themes, the NACEPT group also identified a number of recommendations for the way that EPA could improve its ability to anticipate and address emerging trends. These included:

- Create ongoing scanning process that involves all of the Agency
- Support ongoing work of futures activities and provide training in futures tools including scanning, scenario development, and modeling
- Incorporate futures analysis into strategic planning framework

ENVIRONMENTAL COUNCIL OF THE STATES (ECOS) "PLANNING FOR THE ENVIRONMENTAL FUTURE: PRELIMINARY STATE PERSPECTIVES ON THE CHALLENGES AHEAD," APRIL 2005.

In a meeting facilitated by EPA's Office of the Chief Financial Officer, a group of ECOS members informally identified a number of emerging trends and resulting environmental challenges.

Forces Driving Change

The participants identified technology-driven and demographic change as major drivers. Looking at technology-driven changes, the participants identified changes that could do the most to enhance EPA's capability to protect the environment (communication, remediation, and monitoring technologies), those most likely to improve the environment (transportation-related improvements, new energy technologies, and more efficient and complete waste management technologies), and those that could do the most harm to the environment including traditional energy production, e-waste, and unwise use of nano-technology. In addition, the group recognized that some "promising" technologies could have unanticipated negative impacts. For example, an increase in the availability of hybrid vehicles might actually contribute to sprawl.

With regard to demographic changes, the group identified population shifts both on a global and more local scale, especially in environmentally sensitive areas, as a significant driver. The aging population, the participants noted, will result in less consumption, but also in fewer revenues for the state and other governments to address problems. In addition, the group noted that changing consumption patterns (increase in "green" purchasing) can also have major environmental impacts.

Emerging Issues

The participants identified major environmental concerns (for the next twenty years) in three categories; well known concerns, potential surprises, and issues not on EPA's radar screen.

Well known concerns: water quality and quantity, air pollution, climate change, and economic change.

Potential Surprises: energy technology changes, climate change, existing chemicals, ocean pollution, and limitations in ability to respond to problems with technology

Issues not on EPA radar screen: issues related to energy production and use, need for increased coordination with other agencies in dealing with a range of issues including energy policy and water management, and other issues including land conservation, invasive species, and homeland security issues.

Incorporating Foresight Into Agency Planning

Participants identified a number of issues that needed to be addressed in EPA's Strategic Plan. These include climate change, ecosystem health and services, needed investment in monitoring and basic research. Other suggestions included increasing transparency of underlying information and increasing involvement of regions in planning process.

Nearly all participants noted the need for EPA to devote more attention to identifying emerging issues and problems. Many also pointed out the need for increased cooperation with other agencies and levels of government and increased consideration of regional views and budget sharing.

EPA INNOVATION ACTION COUNCIL FUTURES INTERVIEW SUMMARY, 2004

In the spring of 2004, 23 members of the EPA Innovation Action Council (IAC) participated in a series of interviews that collected information on their views on key environmental problems and trends that EPA will face in 2011 and 2025, the drivers and assumptions underlying these trends, and ways that EPA could address the emerging challenges. In addition, 18 members of the EPA Futures Network answered in the same questions through completion of an online survey.

Emerging Problems

Both the IAC members and the members of the EPA Futures Network most frequently identified water quality and quantity as key issues. Other issues prominently listed by both groups of respondents included climate change, problems associated with energy production, and biodiversity. In addition, the IAC members also frequently cited homeland security and global air pollution while the EPA staff also cited toxic chemicals as a looming problem.

Underlying Causes

In discussing the drivers and trends, respondents sometimes differed on the impact that they might have on environmental issues. For example, one respondent noted that the rate of population growth is the most pressing problem while another pointed out that unpredictable events could prevent this growth. Similarly, some respondents differed on the potential environmental impact of the aging population and its consumptive behaviors and differences arose over the likelihood that energy production would move significantly away from petroleum by 2023.

While these differences obviously affect the way individual respondents view the impact associated with these underlying trends, respondents cited the following as important trends.

- Changing demographics;
- Resource consumption;
- Sprawl;
- Technological change; and

- Cultural changes.

New Strategies

Respondents encouraged EPA to take a more collaborative approach to addressing emerging problems and focus on the emerging social and demographic trends. They highlighted the following as new approaches or emphases the Agency could take:

- Incorporate social science and research why individuals and organizations make the decisions they do;
- Promote sustainability;
- Create and share knowledge;
- Encourage new technology
- Integrate (across media, agencies, and problems) and collaborate
- Enhance and maintain the quality of the EPA work force.

NORTH AMERICAN COMMISSION FOR ENVIRONMENTAL COOPERATION, "FUTURE ENVIRONMENTAL PRIORITIES IN NORTH AMERICA," 2000.

In 2000, the North American Commission for Environmental Cooperation (NACEC) conducted a questionnaire to gather input from the general public on important issues, now and in 20 years. In describing the survey on its website (http://www.cec.org/trio/stories/index.cfm) the CEC noted that "[t]he Future Environmental Priorities Questionnaire was posted on NACEC's web site during September and October 2000. While the identity of the respondents is not known, the fact that they found the survey on the NACEC web site suggests that many may already have been familiar with NACEC and may therefore reasonably be assumed to possess a higher-than-average interest in environmental issues. Given that responses may have been submitted from anywhere in the world, the results cannot be considered a randomly reflective North American perspective." Several of the questions addressed the same themes we raised in our interviews (as described in the next section); responses to those questions are noted below.

What Are the Two Biggest Long-Term Environmental Concerns for You?

The NACEC grouped responses into 18 different categories and the concerns identified by the greatest number of respondents were:

- Loss of habitat/biodiversity;
- Climate change;
- Water quality;
- Population; and
- Air quality.

Forty-five percent of the respondents thought the nature of these problems would get worse over the next 20 years while 22 percent noted that increased awareness of and understanding of the problems would eventually lead to better conditions.

What Do You Think Needs To Be Done Differently To Better Address These (Two) Concerns?

Respondents called for more education and communication, more regulation and monitoring, and a commitment to sustainable development as the most important areas to be emphasized.

Are There Some Emerging Environmental Problems That Deserve More Attention?

Respondents identified a number of issues needing further attention. Most often identified were:

- Climate change;
- The need for potable water; and
- Loss of habitat/biodiversity.

Other issues more frequently named included biotechnology, waste management, chemical and toxic substance release, and fossil fuel-related pollution.

Looking Back From 2020, What Would You Describe As the Triumph of North American Environmental Policy?

There was a great deal of variation in the responses to this question, with the largest number of individuals identifying as the most likely "triumphs":

- Increased awareness and education;
- Increased regulation and monitoring;
- Improved air quality;
- Protection of natural habitats;
- Deployment of clean technologies; and
- Improved water quality.

Interestingly, relatively few respondents identified reduction in greenhouse gases as a likely triumph despite it being ranked as the environmental problem that would deserve the most attention (see above).

EPA INTERNATIONAL FUTURES PROJECT (2000)

In an effort to gain a broad perspective on the challenges facing the country on the international front, the EPA convened two roundtable discussions on international

environmental futures. Prior to the two meetings, the roundtable members were interviewed to determine their perspectives on a series of questions, summarized below:

What Do You Consider To Be the 3 Most Influential Long-Term Global Trends That Hold the Greatest Potential To Reshape the Environmental Challenges We Face In the Next 5 To 20 Years?

The most common responses, listed in decreasing order of frequency, were:

- Population growth and urbanization;
- Globalization of the economy;
- Globalization of information;
- Changes in organizational relationships;
- Technology research and development;
- Loss and degradation of renewable natural systems;
- Transportation of pollution;
- Climate change; and
- Water quality protection and the health of hydrologic systems

What Are the Top Issues That the United States and EPA Must Address In the Next 5 To 20 Years?

The most common responses, listed in decreasing order of frequency, were:

- Climate change;
- Proliferation of chemicals;
- Sustainable development, effective resource management;
- Biotechnology;
- Changes in energy use;
- Financing infrastructure change;
- Providing tools for use by local government; and
- Biodiversity and habitat preservation.

What Steps Should EPA Take To Address These Challenges Over the Next 20 Years?

Respondents offered the following suggestions.

- Continue to improve information and data management.
- Decide if it should be an agreement broker or a scientific agency.

- Improve outreach.
- Solidify its role as purveyor of technical assistance.
- Take a more holistic approach to environmental protection across all media.
- Continue work with the private sector.
- Explore market based approaches.
- Collaborate more with other federal agencies.
- Consider separating into science and regulatory agencies.

Roundtable Discussions

Some of the key recommendations that came out of the two days of the roundtable discussions are noted below:

- Improve the technological capabilities of EPA.
- Improve scientific analyses within the Agency.
- Increase involvement in environment and trade discussions.
- Promote EPA as a facilitator on International environmental issues.
- Increase marketing of EPA contributions and skills.
- Establish clear linkages between domestic and international issues.
- Help develop finance mechanisms for environmental projects.
- Recognize decentralization of domestic and foreign governments and cultural differences.

FORESIGHT AND GOVERNANCE PROJECT, WOODROW WILSON INTERNATIONAL CENTER FOR SCHOLARS "NEW GLOBAL AGENDA," 2004.

In a paper prepared for the Foresight and Governance Project of the Woodrow Wilson Center, the Institute for Environmental Futures reviewed nine analyses of global environmental issues and focused on how these studies analyzed three questions.

- What problems pose the most serious threats to the global environment and to continuing economic development?
- What are the underlying causes of these global environmental problems?
- What changes in governance strategies are needed to deal with global environmental problem and their underlying trends.

STUDIES REVIEWED

* World Resources 2000-2001: People and Ecosystems: A study published by the World Resources Institute.
* Environmental Outlook: A study published by the Organisation for Economic Development and Co-operation (OECD).
* World Development Report 2003: A Study published by the World Bank.
* One with Nineveh: Politics, Consumption, and the Human Future: A book by Paul and Anne Ehrlich.
* Red Sky at Morning: America and the Crisis of the Global Environment: A book by James Gustave Speth.
* Global Environment Outlook 3: A study published by the United Nations Environment Programme (UNEP).
* Global Trends 2015: A study published by the Central Intelligence Agency (CIA).
* The Environmental Future: Emerging Challenges and Opportunities for the EPA: A study published by the National Advisory Council for Environmental Policy and Technology (NACEPT).
* Plan B: Rescuing a Planet Under Stress and a Civilization in Trouble: A book by Lester R. Brown.

The tables below summarize the main points of consensus among the studies as captured in the report.

Table 1. Consensus on Problem Areas.

Source	Major Problems: Water Quality and Access	Climate Change	Biodiversity	Indoor Air Quality	Air Pollution	Food Production/Soil Degradation	Over-Fishing	Deforestation
World Resources 2000-2001: People and Ecosystems (WRI)[1]	●	●	●		○	○	○	○
OECD Environmental Outlook[2]	●	●	●		○	○	●	●
World Development Report 2003 (World Bank)[3]	●	●	●		●	●	●	●
One with Nineveh (Paul and Anne Ehrlich)[4]	●	●	●		○	○	●	○
Red Sky at Morning (Gus Speth)[5]	●	●	●		○	○	○	
Global Environment Outlook 3 (UNEP)[6]	●	●	●			○	○	○
Global Trends 2015 (CIA)[7]	●	●	●		○	●		○
The Environmental Future: Emerging Challenges and Opportunities for the EPA (NACEPT)[8]	●	●	●	●	○			
Plan B: Rescuing a Planet Under Stress and a Civilization in Trouble (Lester Brown)[9]	●	●			○	●	○	○

●: Problem is a *serious* threat to the global environment and continued economic development.
○: Problem is a threat to the global environment.

Table 2. Consensus on Underlying Causes.

Source	Major Causes: Population Growth	Consumption Patterns	Market Failure/Policy, Political Failure	Nature of Technology	Culture, Worldviews, Values
World Resources 2000-2001: People and Ecosystems (WRI)[32]	■	■	■		■
OECD Environmental Outlook[33]	■	■	■	●	
World Development Report 2003 (World Bank)[34]	■	■	■	●	■
One with Nineveh (Paul and Anne Ehrlich)[35]	■	■	■	■	■
Red Sky at Morning (Gus Speth)[36]	■	■	■	■	■
Global Environment Outlook 3 (UNEP)[37]	■	■	■	■	
Global Trends 2015 (CIA)[38]	■	■			
The Environmental Future: Emerging Challenges and Opportunities for the EPA (NACEPT)[39]	■	■	■	■	●
Plan B: Rescuing a Planet Under Stress and a Civilization in Trouble (Lester Brown)[40]	■	●	■	●	

■: Underlying cause is a *significant* contributor to the degradation of the global environment.
●: Underlying cause contributes to the degradation of the global environment.

Table 3. Governance Strategies to Address Specific Underlying Causes

Source	Roles: Accelerate Demographic Transition	Eliminate Mass Poverty	Catalyze an Environmental Revolution in Technology	Rightly Frame Markets	Encourage Sustainable Consumption	Create and Share Knowledge
World Resources 2000-2001: People and Ecosystems (WRI)[76]	●	●		■	■	■
OECD Environmental Outlook[77]			■	■	■	●
World Development Report 2003 (World Bank)[78]	●	●	●*	●	●	●
One with Nineveh (Paul and Anne Ehrlich)[79]	■	■	■	■	■	■
Red Sky at Morning (Gus Speth)[80]	●	■	■	■	■	■
Global Environment Outlook 3 (UNEP)[81]		●	●	●	●	●
Global Trends 2015 (CIA)[82]						
The Environmental Future: Emerging Challenges and Opportunities for the EPA (NACEPT)[83]	■	●	■	■	●	●
Plan B: Rescuing a Planet Under Stress and a Civilization in Trouble (Lester Brown)[84]	●	●	●	■	●	●

*The report's focus on institutional development that makes it possible to use market mechanisms more effectively.

■: Role is critical for reversing serious environmental trends.
●: Role is useful for reversing serious environmental trends.

FINDINGS FROM INTERVIEWS

This section presents findings based on the responses provided by the 15 interviewees to the 10 questions included in this study. The findings are presented in four categories: Key Trends and Issues; EPA's Current Response Capability and Performance; Opportunities to Improve EPA's Response Capability; and Documenting Success. Exhibit 1 illustrates how the questions map to these four categories.

EXHIBIT 1 – MAPPING OF INTERVIEW QUESTIONS TO FINDINGS CATEGORIES

CATEGORY	QUESTION
Key Trends and Issues	1. What do you consider to be the most influential long-term trends or forces (whether social, economic, technological, or otherwise) that are most likely to impact the environment over the next ten years?
	4. What do you consider to be the top environmental issues or challenges that the EPA must address in the next 10 years?
EPA's Current Response Capability and Performance	2. What is your opinion on whether EPA is adequately addressing these trends or developments?
	5. What might limit the Agency's ability to respond to the identified issues?
Opportunities to Improve EPA's Response Capability	3. What steps could EPA take to improve its ability to anticipate and address these trends and related issues?
	6. What are some specific steps that the Agency could take to respond to the issues and overcome the constraints?
	7. What might the Agency look like ten years from now and what major changes in the way the Agency currently operates should be implemented now to achieve this ten year vision?
Documenting Success	8. Over the next ten years, how would you define success for the EPA?
	9. What measures would indicate success or failure for the Agency in the next ten years?

The interviews conducted as part of this analysis in part reaffirmed the findings of earlier assessments—most of the issues that had been identified previously as emerging challenges for EPA remain so in the eyes of the interviewees, although climate change

was widely recognized as presenting an increasingly dominant set of challenges. Similarly, in the opinion of the interviewees, the steps EPA can take, in general, to prepare for and more effectively respond to these challenges are primarily associated with the application of sound science in an increasingly collaborative and cooperative manner. The main themes that emerged from the interviews include the following.

- **Climate change presents a challenge that most of the interviewees believe will require substantial EPA involvement over the next ten years and beyond.** In fact, most of the interviewees viewed climate change not just as one issue among many environmental challenges; they described it as a long-term trend on par with, and directly linked to, other macro forces such as population growth and technological development.
- **EPA does or should play a pivotal role as the nation's leading source of environmental science and technology and should foster collaborative and cooperative relationships with all public and private sector interests.** Many of the interviewees highlighted the need for improved lines of communication—within the Agency, between the Agency and the states, and between the Agency and other public and private stakeholders—as a critical element of this role. Perhaps separate into two that separate the research component from the communications and collaboration.
- **Some factors that will influence the degree to which EPA is successful over the next ten years remain largely beyond the Agency's control.** Interviewees frequently cited the constraints imposed by authorities granted (or not granted) to the Agency by Congress and the financial resources at the Agency's disposal.

This summary of findings captures these and other important themes that emerged from our interviews, but does not attempt to convey the full breadth of the interviewees' comments. At least a portion of each interviewee's comments focused on specific challenges or opportunities within his/her area of expertise (which is the primary lens through which they view EPA's actions). Appendix A provides an expanded summary of the responses to each question, highlighting the range of interviewees' answers as well as the frequency with which common answers were offered.

KEY TRENDS AND ISSUES

Several of the interviewees provided thoughts on "macro" trends, including population growth, the emergence of new global economic powers, global instabilities, and the growing recognition of the concept of "sustainability," all of which have significant implications for environmental protection. However, most chose instead to focus on the key issues EPA is likely to face over the next decade. While interviewees tended to emphasize issues most closely related to their area of expertise, most also singled out climate change as the most significant issue that EPA must address over the next ten years. In doing so, they noted the wide array of likely climate change-related challenges

ahead, from the development of new regulatory programs and resource management strategies to the need to address changing land use patterns and the alteration of natural habitats. The climate challenge also provided the context within which interviewees stressed the need for a focus on strong science, support for technological development, and close, productive relationships with other federal agencies as well as private sector interests.

The other issues that interviewees identified fall into four general categories: the quality of air, water, and land resources; management of chemicals in the environment; responses to technological development; and EPA's relationships with stakeholders.

Quality of Air, Water, and Land Resources

Many of the interviewees stressed that the issue of improving and maintaining air, water, and land quality will remain a critical one for EPA over the next decade. In addition, several commented on the ways in which the scope of these more "traditional" challenges has expanded in the face of both local and global development patterns. For example, they noted that air quality is no longer just a local or regional issue with the growth of transboundary pollution from developing world countries that is less easily influenced by EPA decisions and actions, that competition between agricultural and other users for increasingly scarce freshwater resources is growing stronger, and that climate change-induced alterations of the landscape(e.g., more regular inundation of floodplains) will affect the way in which land development occurs.

Management of Chemicals In the Environment

Several interviewees commented on the issue of chemicals in the environment, particularly EPA's ability to regulate them effectively as more and better data become available and as demands for effective response grow louder. Of particular note were references to the European Union's Registration, Evaluation, Authorisation and Restriction of Chemical substances (REACH) regulations, as a potential indicator of the direction in which U.S. regulation might soon be headed. At the same time there was recognition that the classic tools and tests EPA employs may not be sufficiently sensitive to detect new classes of contaminants in the environment, such as pharmaceutical products, nor sufficiently advanced to understand in depth the toxicological profiles of the growing number of chemicals in commerce.

Responses To Technological Development

Comments that addressed technology as an important issue were almost exclusively forward-looking, with the exception of one reminder that existing environmental management infrastructure (e.g., solid waste landfills, wastewater treatment facilities) is decaying, with limited resources available for repair or replacement. The forward-looking comments expressed optimism as well as caution. On the one hand, multiple interviewees expressed the belief that we have not yet explored the extent to which technology can both solve problems and lead to more efficient uses of our resources. Within the IT

industry, for example, the potential impact of developing monitoring, decision making, and "smart" tools and making them available to other industries is far greater than the impact they can have through efforts to reduce their own environmental footprints, and EPA can do more to foster that transfer. On the other hand, some of the interviewees noted that we lack full understanding of the consequences of new technology deployment (e.g., nanotechnology, the large scale deployment of renewable energy technologies), and that while the environmental benefits from their deployment may be significant, we also need to account for and properly manage any associated externalities.

EPA's Relationship With Stakeholders

Separate from strictly technical or scientific issues, the subject of collaboration, cooperation and communication with stakeholders was a common theme across interviews. Several interviewees expanded on this point, offering specific examples of the challenges EPA faces in ensuring that good decisions are made based at least in part on input from those most affected by the decisions. One of the biggest challenges revolves around accessibility to information and data. As one interviewee noted, the general population can be characterized in the simplest terms by those who are knowledgeable about environmental issues and what to do about them, and those who are not. In some communities, often the ones that face disproportionate environmental impacts, this knowledge gap, or condition of "information asymmetry," is particularly acute. Among all communities, even those with more knowledge and available tools, EPA is challenged to reach out to individual citizens to get them to recognize their own impact on the environment and to encourage their adoption of new tools and behaviors.

EPA'S CURRENT RESPONSE CAPABILITY AND PERFORMANCE

This section summarizes interviewees' answers to questions that focus on how well EPA is responding to trends and, more importantly, on factors that are limiting the Agency's response capability. In response to the question, "Is EPA doing well?," the general consensus was yes, particularly in its fulfillment of statutory obligations, in its demonstration of expertise in core subject areas, and in its development of tools enabling other groups, such as states and Tribes, to contribute to environmental protection. In fact, several interviewees made a point of describing EPA as the preeminent environmental agency not just in the United States but in the world, and further expressed the importance of ensuring that the Agency retains this status.

At the same time, each interviewee described at least one area of perceived weakness, usually in the context of an internal or external force that serves to limit the Agency's effectiveness. Two types of limitations were described with the greatest frequency, those associated with financial and human resources and those associated with the scope of EPA's portfolio of environmental protection responsibilities.

Resources

Many of the interviewees expressed a belief that EPA has insufficient financial resources to accomplish its mission and that, while EPA's staff is talented and committed, it is also challenged to recruit and retain the most highly qualified people and thus risks being unable to maintain the necessary level of expertise. They noted that while the Agency's resources are fully employed on the activities currently within its charge, expectations of what EPA can or should do are increasing at the same time that budgets are decreasing,

forcing the Agency to think of ways to do more with less. This trend runs counter to, or at least severely constrains, the need to offer competitive salaries to the "best and the brightest" who might otherwise not consider a government career.

Scope

Some of the interviewees' comments addressed the limitation created by the tension between EPA's basic mandate and what it is authorized to do, and the expectation that the Agency can "do it all." Specifically, it was noted that:

- EPA can be limited by statute, and not just because Congress has not granted the Agency the authority to intervene in every environment-related issue, but also because the wording of a statute that does grant authority may itself limit EPA's ability to respond effectively.
- EPA faces an "image problem" resulting from the perception that the Agency "does everything" related to the environment. This perception leads to expectations that the Agency cannot meet.
- As discussed further below, the Agency is limited to some extent by a structure that mirrors the primary environmental protection statutes and thus results in an emphasis on regulatory activity and enforcement (or as one interviewee described it, "when you have a hammer, everything looks like a nail"). This emphasis constrains the Agency's ability to address cross-cutting problems in a flexible manner or to collaborate with other agencies on issues of mutual concern.

It is also worth noting that the influence of politics on EPA's work was also described more than once as limiting the degree to which the scope of EPA's work is clearly defined and understood. As one interviewee stated, the political environment is the single biggest challenge EPA faces, as it is one of the government agencies most affected by politicized decision making; this slows the decision-making process and also prevents EPA from maximizing its effectiveness.

OPPORTUNITIES TO IMPROVE EPA'S RESPONSE CAPABILITY

Three questions posed to the interviewees focused on steps EPA might take to anticipate trends, respond to emerging issues, and overcome existing constraints. These questions also provided the interviewees with an opportunity to suggest alterations in the way EPA is organized that might help the Agency meet its responsibilities more effectively. The suggestions offered by the interviewees fall into four general categories: focus and expertise, organization, approach, and collaboration.

Focus and Expertise

The interviewees' opinions regarding where EPA should focus its efforts and develop and maintain expertise are varied and not internally consistent. While some see the greatest value in having EPA adhere to its traditional, "core" mission, others see an opportunity

for EPA to rethink the nature of its role. Either way, several interviewees noted the need for EPA to define and be certain of its role.

The interviewees seemed to offer two general models for EPA going forward and while the two are not mutually exclusive, the challenge of implementing them both and doing so successfully, particularly in the face of resource constraints, was readily apparent from their comments. In the first model, EPA would continue doing what it does best (stay focused on its primary role of controlling pollutants; do only what the statutes require) and work to make sure it continues to perform well in that role. In the second model, EPA would maintain its core mission but would also develop new structures and mechanisms to apply its expertise in the most efficient and effective way possible to the difficult and emerging challenges that lie ahead.

On balance, more interviewees expressed support for the second model over the first or, more specifically, for the model of EPA as an organization on the leading edge of applied science and technology rather than as an organization focused only on regulation and enforcement. At the same time, they recognized the need to define boundaries, suggesting ideas such as a limited focus on the biggest or most complex challenges, with a higher degree of collaboration on "lesser" issues that might be best served through the application of another agency's expertise. Similarly, different ideas were offered for how to build and structure the technical leadership that would be required to take on the biggest challenges, from the creative use of multidisciplinary (i.e., cross-Agency) teams to the development of "flexible," rather than targeted, expertise capable of responding to any number of issues that might arise in the context of an overarching issue.

Organization

The majority of the interviewees did not offer specific suggestions for changes in EPA's overall organization, but those who did approached this question from a variety of angles. One anecdote in particular captured the organizational challenge that might consider addressing. In preparing its first Report on the Environment, it was said that EPA found itself unable to provide answers to the public's most significant environmental questions for the simple reason that the data to do so simply were not available. The reason the date were not available was that EPA's organization (dominated by media- or statute-specific "silos") was not aligned with the questions.

Among the suggestions (or wishes) for an alternative structure or for steps that would improve EPA's overall functioning were the following:

- The elevation of the EPA Administrator to Cabinet level.
- The establishment of positions for a Deputy Administrator of Regulation and a Deputy Administrator of Science.
- A six year term for the EPA Administrator in order to provide some separation from the influence of political cycles.

- A deliberate effort to improve communication and information transfer among EPA's different sections and programs, as well as between other national, state, tribal, and local partners.
- Organization by functional expertise in order to facilitate experts' ability to work on similar problems across program offices (and to minimize the perceived underutilization of its staff).
- Organization by a limited number of broad subject area to capture related issues under common umbrellas; for example, water (including agriculture), energy (including transportation), and chemicals (including pollution prevention).

Some notes of caution were also expressed regarding organizational matters. First, an interviewee suggested that when and if Congress delegates broad authority over climate change matters to EPA, the Agency would be taking on an issue that is easily twice as large (in terms of potential economic cost) as any existing regulatory program. Such a mandate could thus require a significant change in the way the Agency operates. A second interviewee expressed more generally that a reorganization of the Agency would involve both a large investment and considerable risk; therefore, it was suggested, EPA should ask instead whether its budget could be structured to enable cross-functional initiatives without a massive reorganization.

Approach

In response to questions asking how EPA could improve its ability to address key issues and overcome existing constraints, the interviewees offered a range of suggestions for new or altered approaches to management challenges. Other than the recurring theme of collaboration (discussed below), these suggestions do not fit easily into thematic categories (perhaps an indication of the wide range of opportunities available to EPA to build on past success), and are therefore presented below as discrete opportunities.

- EPA should continue and make more regular use of outlook panels to explore future trends, but should expand their scope beyond purely research issues to address regulatory issues as well.
- EPA might consider instituting an Office of Clean Technology Deployment and taking steps to educate the public about the relative "greenness" of consumer products, as it does so effectively for consumer appliances.
- Given financial resource constraints and the need to increase productivity, the Agency should explore ways to take advantage of computational power in ways that may not have been considered, such as maximizing modeling and simulation efforts as substitutes for more time-consuming and expensive approaches (e.g., data-intensive environmental monitoring).
- From a design perspective, a regulation is a signal of design failure, meaning that when there is a need to regulate there is something wrong. EPA should adopt a

design frame of mind (for example, promoting green chemistry) in order to embrace opportunities for new approaches to problems.

- EPA could put more of a focus on what it could do to drive technology adoption into other sectors. Where technology already exists, EPA is needed to implement standards and aggregate information to facilitate its adoption. Efforts in this regard could include a technology advisory board or more emphasis through the NACEPT Council.
- Citizens have become accustomed to performing the functions of their personal life online and they expect to be able to move their interactions with the government (e.g., getting their driver's license) online as well. The government should look to create an environment of openness using emerging concepts such as enterprise social networking, which involves tools similar to Facebook and other forms of social networking. Enterprise social networking tools would let EPA and other government agencies enlist more public involvement in its activities.
- EPA could learn from the example of the Cherokee "Earth Watchers" who embrace the mindset of being a steward of the environment, using funding effectively, implementing programs correctly, and planning for future generations.

Collaboration

One of the most widely held views among the interviewees was that EPA can and should work toward greater collaboration with other federal agencies, with state and tribal organizations, with industry, with local communities and the public in general, and with international partners. Several interviewees noted that at the federal level collaboration would include instances in which EPA shares responsibility in a clear and organized fashion as well as instances in which the Agency defers to a sister agency and assumes a more supportive role. As an example of the former, an interviewee highlighted a provision in the 2007 Energy Bill, which has several biofuels opt-out provisions phrased in such a way that the EPA Administrator, Secretary of Agriculture, and Secretary of Energy would be required to reach decisions jointly. The message conveyed by interviewees regarding collaboration with non-federal parties was simple and consistent: absent opportunities for direct input into decision-making processes, structured in a way that does not provide an advantage to one stakeholder over another, EPA's management of environmental challenges will be sub-optimal.

DOCUMENTING SUCCESS

This section presents interviewees' responses to the questions asking how to define success for EPA and how to measure whether or not EPA has been successful in fulfilling its mission. Consistent with responses to other categories of questions, the interviewees suggested definitions of success that range from the general to the more specific. The common theme among the more general definitions is straightforward: EPA is successful

if it fulfills its mission to protect human health and the environment, as demonstrated by quantifiable improvements in air and water quality. Beyond the general definition, the responses offered several different ways to think about success, though many addressed the belief that EPA would be successful if it were to position itself as the widely acknowledged thought leader on issues of science and technology. Others stressed the need to think about success in terms of both quantifiable environmental quality metrics *and* institutional frameworks; that is, taking credit for success in forming partnerships as well as for the results that the partnership produced. Perhaps the most straightforward response to the question of how EPA might define success came from the interviewee who defined it as the ability to provide relevant, accurate data that address the questions the public wants answered.

As with the definition of success, interviewees approached the question of how to measure success from multiple angles. Most focused on measurement concepts rather than individual metrics, though several of the latter were noted (e.g., pollutant concentrations in air and water, coral reef health, number of industrial facilities located in environmental justice communities). For example, it was suggested that EPA could measure its success by its ability to attract and maintain a good staff, by looking retrospectively at the "bets" it made on the types of expertise it would need and seeing a very high "success" rate, and by demonstrating that it has implemented elements of its strategic plans that incorporate the needs of all stakeholding interests. Two comments capture the general perspective on performance measurement offered by the interviewees: on the one hand, there is a sense that insufficient attention is paid to concrete measures of a regulation's success in improving environmental quality or human health (e.g., the way the phase-out of lead in gasoline was shown to be clearly beneficial), but on the other hand, measures of progress must be defined in terms other than simple bean counting; "blue sky measures" are also appropriate for setting long-term goals.

NACEPT FINDINGS

[TO BE COMPLETED]

NACEPT RECOMMENDATIONS

[TO BE COMPLETED]

Appendix A: Compilation of Interviewee Responses

Theme 1: Key Trends and Issues (Questions 1 and 4)

Common responses (and the number of interviewees who offered the response) include:

Climate change [14]
Quality of air, water, and land resources [9]
Management of chemicals in the environment [6]
Responses to technological development [4]
EPA's relationship with stakeholders [3]
Global economic development [6]
Population growth [4]
Rising demand for secure energy resources [2]

Additional responses addressing key trends and issues include:

- The shift away from petroleum use in energy production, plastics, and transportation.
- The development of an active market for carbon, resulting in renewable energy technologies becoming economically competitive.
- The environmental effects of the wide-scale deployment of renewables.
- The depletion of ocean resources such as fish and coral reefs.
- Plastics in the oceans which come from US storm-water systems.
- Ocean acidification.
- Green chemistry.
- Habitat loss.
- The increasing burden on our nation's food supply and the environmental implications of agricultural expansion.
- The disruption of the nitrogen cycle leading to a significant increase in nitrogen emissions into the environment, from fertilizers and energy sources.
- Our nation's decaying infrastructure.
- Global instability due to religious and cultural divisions.
- Policy constraints.
- The permitting process as it relates to environmental justice issues.
- Recycling.
- Major economic institutions' recognition of the importance of sustainability, and the corresponding flow of resources into this area.
- The need to develop sustainable communities that not only have a lower environmental impact, but that are also livable and affordable.

Theme 2: EPA's Current Response Capability and Performance (Questions 2 and 5)

Common responses (and the number of interviewees who offered the response) include:

Lack of financial resources [8]
Lack of staff resources [4]
Limitation imposed by the scope of EPA's mandate [3]
Political constraints [6]
Need for more strategic planning [4]
Need for more collaboration with states, tribes, and other agencies [7]
EPA is meeting its statutory obligations [2]
Limited imposed by EPA's conflicting roles of regulator and researcher [2]
Need to develop and maintain technical capacity to keep up with science [2]
EPA should be more active internationally [3]

Additional responses addressing EPA's current performance and capability include:

- EPA must focus on developing and maintaining core expertise in a limited number of areas.
- EPA often limits Tribes' ability to implement their own programs.
- EPA is not responding well enough to current issues, as most programs are delegated to the states.
- The Agency should aid communities in standing up to pressure from industry.
- With regards to climate change, EPA has been missing in action. The Agency needs to pursue strategies of both mitigation and adaptation.
- EPA should look to increase its efforts in design for the environment, environmentally-friendly purchasing, and green chemistry initiatives.
- EPA scientists need the freedom to function, and science needs to be taken seriously.
- Turf issues within the Agency remain a significant barrier to good management.
- The Agency should be attentive to doing things on schedule.
- EPA is not sufficiently keeping pace with trends and issues.
- The Agency needs to look at problems in a broader context.
- EPA's role as a regulator in maintaining compliance with existing laws enforces the level playing field that is necessary for companies to compete fairly.
- EPA's role as a promoter of voluntary partnership programs allows companies to receive credit and recognition for their environmental initiatives.

Theme 3: Opportunities to Improve EPA's Response Capability (3,6,7)

Common responses (and the number of interviewees who offered the response) include:

Work collaboratively with other Agencies [10]
Invest more in scientific research and development [4]
Increase use of advisory panels and forums to seek stakeholder input [4]
Improve communication with and information transfer to the public [4]
Change organizational structure to allow for more flexibility and collaboration [3]

Obtain the statutory authority to address climate change [4]
Put more thought into how the Agency shares responsibility with the states and Regions [3]
Look at issues with a more broad-based, systematic approach [2]
Focus on pollution prevention [2]
Serve as a clearinghouse for best practices [2]
Attract employees who are the "best and brightest" [2]

Additional responses addressing opportunities for improved capabilities include:

- EPA should focus its attention on developing "flexible" expertise capable of responding to whatever challenges rise to the forefront.
- EPA should pick a few areas to specialize in, and work with other agencies which have developed expertise in other areas.
- EPA needs to take more creative steps without sacrificing responsibility.
- EPA should try to increase productivity with the same budget, possibly through increased modeling and simulation efforts.
- EPA should improve the communication and information transfer among its different sections and programs, as well as between the national, state, and local levels.
- EPA must deal with the interplay between the executive and legislative branches
- EPA should implement better management strategies.
- The Agency needs a high-level strategy for accountability.
- EPA needs to provide alternate standards for the accountability of R&D programs.
- EPA should analyze the grant projects it funds and assess which projects provide the best returns.
- EPA should assess what partnerships best position the Agency to achieve its long-term goals.
- EPA should reconsider its conflict of interest rules, as they potentially prevent the most qualified and experienced individuals from participating in advisory forums
- The strategic planning process is extremely important and it is necessary, going forward, to include Tribal specific language in the Strategic Plan.
- EPA could engage economists to aid environmental justice communities.
- The permitting process needs to be looked at from a sector perspective, or through the consideration of ambient air and water quality.
- EPA could put more of a focus on what it could do to drive technology adoption into other sectors.
- EPA should promote healthy competition among companies to encourage environmental improvements.
- EPA needs to ask itself whether the budget could be structured to enable cross-functional initiatives without a massive reorganization.
- EPA could change its organizational structure to include an Administrator, Deputy Administrator of Regulation, and a Deputy Administrator of Science.
- EPA's structure could be to detached from political cycles, for example with a six year term for the Adminstrator.
- Ten years from now, it would be nice to see the Agency at the Cabinet level.

Theme 4: Documenting Success (8, 9)

Common responses (and the number of interviewees who offered the response) include:

Measurable improvements in ambient water and air conditions [7]
Increased investment in technology [4]
Develop a reputation as a source of credible science [4]
Develop and maintain a qualified staff, including scientists [4]
Acquire the authority and set regulatory standards for GHG emissions [3]
Success for EPA can be defined as the fulfillment of its mandate [3]

Additional responses addressing the definition and measures of success include:

- The provision of basic environmental and public health protection.
- Reduced impact of environmental issues on humans and ecosystems.
- Success for EPA would be having the agency on the cutting edge, making policies that address the issues we're facing.
- EPA needs to get its house in order, chart a path forward, and pursue collaboration aggressively.
- EPA needs a broad range of success options across the board, one of which should be institutional.
- Metrics and indicators oriented on the desired end state of environmental improvement should be coupled with other quality of life metrics to show a balanced picture.
- Better and more comprehensive modeling.
- An increased level of strategic planning implemented by the Agency, including tribal-specific language in all the goals.
- Progress in enhancing energy security.
- Decreased dependence on foreign petroleum.
- Infrastructure improvements.
- Measure the health of coral reefs in U.S. territorial waters and make clear the connection between terrestrial activity and impacts on the reefs.
- The implementation of programs to address nutrient buildups in important areas such as the Mississippi basin and the Chesapeake Bay, and an effective system for screening and controlling toxic chemicals.
- Fewer industrial facilities sited near environmental justice communities.
- A change in the public consciousness around the fact that human artifice could be a good thing instead of a bad thing.
- EPA should contribute to a significant increase in environmental literacy and consideration of environmental issues.
- EPA should set a good example by "living its mission" through the reduction of its own waste streams and its environmental footprint.
- EPA should stand for hope for the children, as an agency that is leading the way to a clean, green future.